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SINGLE STACK EXERCISE MACHINE WITH ADJUSTABLE PULLS

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SINGLE STACK EXERCISE MACHINE WITH ADJUSTABLE PULLS

FIELD OF THE INVENTION

The present invention relates generally to weight lifting devices for strength training and conditioning and, more particularly, to a weight lifting device having a plurality of vertically-adjustable pulls connected to a single weight stack.

BACKGROUND OF THE INVENTION

Weight training is a common form of exercise used for strength training and conditioning. Many types of weight lifting machines have been devised in the past for this purpose. In general, a weight lifting machine comprises a force-applying member, such as a bar or pull element, connected by cables and pulleys to a weight stack. The user typically pushes or pulls the force-applying member to exercise. Resistance to the user's efforts is provided by the weight stack.

Weight lifting devices, in general, may be categorized as either single-station or multi-station machines. Single-station machines are typically designed to exercise a specific muscle group, such as the leg muscles, arm muscles, or abdomen and back muscles. Many single-station exercise machines are required to exercise all muscle groups. A complete set of such machines requires a large amount of space and would be expensive to purchase.

Multi-station exercise machines are also known that combine many different exercise devices into a single machine. Multi-station exercise machines typically comprise one or more weight stacks. Each weight stack is coupled through a cable and pulley arrangement to multiple force-applying devices. One example of a multi-station exercise machine of this type is shown in U.S. Patent No. RE34,572 to Johnson et al. While more compact and less expensive than a

full set of single-station machines, multi-station machines still tend to be too large and expensive for residential use.

BRIEF SUMMARY OF THE INVENTION

The present invention relates to an exercise machine having adjustable force-applying members that can be independently adjusted to a desired position by the user. The adjustable force-applying members are connected to a single weight stack by a cable and pulley system. The cable and pulley system includes a dual sliding pulley assembly connecting the adjustable force-applying members. The dual sliding pulley assembly includes a movable pulley associated with each one of the force-applying members. The movable pulleys are mounted on sliding carriages that move along vertical guides. A first cable is connected at one end to a first one of the force-applying members and at the opposite end to a first sliding carriage. A second cable is connected at one end to the second force-applying member and at the opposite end to the second sliding carriage. The first and second cable form, in effect, closed loops that allow independent vertical adjustment of the first and second force-applying members.

The first cable passes around a first one of the movable pulleys and a first floating pulley. The second cable passes around a second one of the movable pulleys and a second floating pulley. A third cable is connected at opposing ends to the first and second floating pulleys which effectively connects the first and second force-applying members. The third cable supports a third floating pulley that is connected to a fourth cable. The fourth cable connects, either directly or indirectly, the dual sliding pulley assembly to the load. In a preferred embodiment of the invention, the fourth cable connects to a floating pulley that is carried by a fifth cable that, in turn, is connected to the load. A third exercise unit may be connected to the fifth cable.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of the exercise machine of the present invention.

Figure 2 is a side elevational view of the exercise machine of the present invention.

Figure 3 is a detailed view showing the cables and pulleys connecting the dual-sliding pulleys.

Figure 4 is a schematic diagram illustrating the cable and pulley system.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, the exercise machine of the present invention is shown therein and indicated generally by the numeral 10. Exercise machine 10 comprises a frame structure 12, a vertically-movable weight stack 60, at least two force-applying members 80, and a cable and pulley system 100 connecting the force-applying members 80 to the weight stack 60.

Frame structure 12 comprises two laterally-spaced side frames 14, 16 connected by cross members 32, 34, 36. Side frame 14 comprises a bottom member 18, front member 22, and back member 26. Side frame 16 comprises bottom member 20, front member 24, and back member 28. Support feet 56 are attached to the ends of the bottom members 18, 20. Front members 22, 24 extend upwardly at a slight angle from the forward end of respective bottom members 18, 20. Back members 26, 28 extend upwardly from the rearward end of respective bottom members 18, 20 and are joined to the top end of respective front members 22, 24.

Side frames 14, 16 are connected by cross members 32, 34, 36 to form a rigid, self-supporting frame structure. Forward cross member 32 extends between the upper end of front members 22, 24. Cross members 34, 36 extend between and are connected to back members 26, 28. The lower back cross member 36 has flanges on either end that connect the lower back cross member 36 to the back members 26, 28 of the side frames 14, 16. The upper back cross

member 34 has a mounting bracket mounted at either end to connect the upper back cross member 34 to back members 26, 28 of the side frames 14, 16. The mounting brackets extend rearwardly from the back members 26, 28 so that the upper back cross member 34 and lower back cross member 36 both lie in the same vertical plane, referred to herein as the back plane.

Frame structure 12 further includes a top member 42 that extends forwardly and rearwardly along a medial plane of the exercise machine 10. A bracket 44 connects the forward end of top member 42 to the forward cross member 32. Support member 46 connects the rearward end of top member 42 to the upper back cross member 34. Top member 42 supports a series of pulleys forming part of the cable and pulley system 100, which is shown in Figure 4. Top member 42 also supports the load of the weight stack 60 while exercises are being performed.

An upper guide assembly 48 is connected to the rearward end of the top member 42. A lower guide assembly 50 is connected to the lower back cross member 36. A pair of guide rods 52 extend between the upper guide assembly 48 and lower guide assembly 50. Guide rods 52 extend through the weight stack 60 and guide the movement of the weight stack 60 while exercises are being performed.

Weight stack 60 comprises a plurality of individual weights which, for example, may be ten pounds each. The weight stack 60 is conventional in construction and, therefore, is not described in detail. To briefly summarize, each weight has a pair of laterally-spaced guide holes through which the guide rods 52 extend. Each weight further includes a central hole through which a pick-up rod (not shown) extends. The pick-up rod extends downward through the weight stack 60 from the uppermost weight. The pick-up rod has a series of apertures that align and register with horizontally-drilled openings (not shown) in each of the individual weights. The user selects the amount of weight to use for a particular exercise by inserting a lock pin through the horizontal opening in one of the weights and a corresponding aperture in the pick-up rod.

The cable and pulley system 100 connects to the uppermost weight. When force is applied by the user to one of the force-applying members 80, the weights lifted include the weight through which the lock pin extends and all weights above that weight.

The exercise machine 10 of the present invention has three force-applying members 80. The force-applying members 80 in the disclosed embodiment comprise pull handles 82, 84, 86 that are connected to the weight stack 60 by the cable and pulley system 100. Pull handle 82 is referred to herein as the high pull 82. Pull handles 84, 86 are referred to herein as adjustable pulls 84, 86. The high pulls 82 is located at the forward end of the top member 42. The adjustable pulls 84, 86 are located along the back plane of the exercise machine 10 and are vertically adjustable. As will be described more fully below, the adjustable pulls 84, 86 connect to cables that pass through sliding pulley assemblies. The sliding pulley assemblies are vertically movable along carriage guides 54 which extend vertically between lower and upper back cross members 34, 36, allowing the user to adjust the position of the adjustable pulls 84, 86.

Those skilled in the art will appreciate that other forms of force-applying members 80 could also be used to practice the present invention. The force-applying members 80 may be connected to a slide that moves in a linear path along a member of the frame structure 12, or may be connected to a lever arm pivotally attached to the frame structure 12. It should be apparent to those skilled in the art how the teachings of the present invention can be applied to different types of force-applying members 80.

The cable and pulley system 100, shown in Figure 4, interconnects each of the pull handles 82, 84, 86 to the weight stack 60. The weight stack 60 may be lifted by use of any one of the force-applying members 80. The cable and pulley system 100 comprises a main cable 102 connected at one end to the weight stack 60 and, at the opposite end, to the high pull 82. Cable 102 passes around three stationery pulleys 104, 106, 108 and around a floating pulley

110. For purposes of this application, the term "floating pulley" shall mean a pulley with a movable axis that is supported by a cable. Cable 102 includes a stop 112 whose function will be explained more fully below.

The cable and pulley system 100 further includes a dual sliding pulley and cable assembly 120, shown in Figure 3. The dual sliding pulley and cable assembly 120 comprises first and second movable pulley assemblies 122, 142. The term "movable pulley" as used herein means a pulley with a movable axis. The first movable pulley assembly 122 comprises movable pulleys 124, 126 mounted on a movable carriage 128. Pulley assembly 142 comprises movable pulleys 144, 146 mounted on a movable carriage 148. Carriages 128, 148 slide vertically along respective carriage guides 54, 56, respectively. Movable pulley assemblies 122, 142 are interconnected such that the position of the pulley assemblies 122, 142 can be adjusted independently of one another.

Cable 130 is attached at one end to movable carriage 128 and at the opposite end to pull handle 84. Cable 130 passes around fixed pulleys 132, 134, 136, 138, around floating pulley 140, and finally passes around movable pulleys 124, 126. Cable 130 includes a stop 114. Similarly, cable 150 is attached at one end to movable carriage 148 and at the opposite end to pull handle 86. Cable 150 passes around fixed pulleys 152, 154, 156, 158, around floating pulley 160, and finally around movable pulleys 144, 146. Cable 150 includes a stop 116. Cables 130, 150 each form a closed loop that allows carriages 128, 148 to move vertically without lifting the weight stack 60. This allows the position of the adjustable pulls 84, 86 to be adjusted to suit the user.

Floating pulleys 140, 160 are connected by a cable 162 which passes around fixed pulleys 164, 166, and floating pulley 170. Floating pulley 170 is connected by a connecting cable 172 to floating pulley 110, which is supported by main cable 102. Cable 172 passes around fixed pulleys 174, 176. Cable 162, floating pulley 170, and cable 172 serve to connect

the dual sliding pulley assembly 120 to the weight stack 60 so that when either one or both of the adjustable pulls are used, the force exerted by the user is resisted by the weight stack 60.

The frame 12 of the exercise machine 10 accommodates a bench/seat 70 which may be used for some exercises. The bench/seat 70 comprises a seat member 72 and back member 74, supported by a seat frame 76. The back member 74 is pivotally connected to a back support member 78, which is received in a sleeve 77. Sleeve 77 is in turn pivotally connected to the seat frame 76. This construction allows the back member 74 to pivot between an upright position as shown in Figure 2, and a laid-back position. The upright position may be a vertical or substantially vertical position. The laid-back position may be a horizontal or substantially horizontal position, an inclined position (less than 180 degree angle with respect to the seat portion 72, or a declined position (greater than a 180 degree angle with respect the seat portion 72). The back member 74 may preferably be locked in several intermediate positions between the upright and laid-back positions.

The exercise machine 10 may further include a brace 90 that is pivotally attached to lower back member 36. The brace 90 preferably pivots between two or more positions. The brace 90 can be secured in a selected position by means of a lock pin 94 that extends through an apertured index plate 92.

When the brace 90 is in a lowered position (shown in dotted lines in Figure 2), it may be used as a foot rest by a person seated on the bench/seat 70. The brace 90 also serves as a stop member to prevent the bench/seat 70 from sliding backwards during exercises when the user is facing away from the exercise machine 10.

In use, the exercise machine 10 of the present invention operates as follows. When using high pull 82, the weight stack 60 is lifted. When high pull 82 is used, stop 118 isolates the high pull 82 from the adjustable pulls 84, 86. Stop 118 prevents floating pulley 110 from moving upward so that cables 130, 150, 162, 172 are not tensioned when high pull 82 is used.

When adjustable pull 84 is used, floating pulley 140 is pulled downward which, in turn, pulls cable 162 causing movable pulley 170 to move upward. Note that stop 116 prevents floating pulley 160 from moving upward when adjustable pull 84 is used. Since floating pulley 170 is connected to floating pulley 110, the upward movement of floating pulley 170 causes floating pulley 110 to move downward, tensioning cable 102. When cable 102 is tensioned, stop 112 engages pulley 108, preventing retraction of cable 102. Thus, a downward movement of pulley 110 lifts the weight stack 60.

Adjustable pull 86 operates in a manner similar to adjustable pull 84. When adjustable pull 86 is used, floating pulley 160 is pulled downward, tensioning cable 162 and causing floating pulley 170 to move upward. Stop 114 prevents floating pulley 140 from moving upward when adjustable pull 86 is used. The upward movement of pulley 170 tensions cable 172 as already described, pulling floating pulley 110 downward and lifting the weight stack 60.

Adjustable pulls 84, 86 may be used singly as described above, or may be used simultaneously. When used singly, the user has a two-to-one mechanical advantage. That is, it takes one hundred pounds of force exerted on either one of adjustable pulls 84, 86 to lift two hundred pounds of weight. When used simultaneously, however, the user has no mechanical advantage. One hundred pounds of force applied to each adjustable pull 84, 86 will still only generate two hundred pounds of lifting force at the weight stack 60.

As previously indicated, the carriages 128, 148 are vertically adjustable along respective carriage guides 54. In the disclosed embodiment, the carriage guides 54 include a series of vertically-spaced apertures 56. Carriages 128, 148 each include spring-biased lock pins 58 that engage with the apertures 56 in the carriage guide 54. The position of carriages 128, 148 can be adjusted by pulling the lock pin 58 outward to disengage the lock pin 58 from the carriage guide 54, sliding the carriage 128, 148 to the desired position, and re-engaging the lock pin 58

with an aperture 56 in the carriage guide 54. Carriages 128, 148 can be adjusted independently of one another.

While the present invention has been described in the context of an exemplary embodiment, those skilled in the art will recognize that the variations of the present invention are innumerable. For example, a force-applying member, such as a lever arm, could be permanently connected to the carriage 128, 148. Also, additional exercise units could be added by adding additional floating pulleys or movable pulleys to multiply the number of pulling points.

The present invention may, of course, be carried out in other specific ways than those herein set forth without departing from the scope and essential characteristics of the invention. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.